



Biofilm thickness controls the contribution of stochastic and deterministic processes in microbial community assembly

Fowler, Jane; Torresi, Elena; Dechesne, Arnaud; Diwan, Vaibhav; Smets, Barth F.

Publication date:
2018

Document Version
Version created as part of publication process; publisher's layout; not normally made publicly available

[Link back to DTU Orbit](#)

Citation (APA):
Fowler, J., Torresi, E., Dechesne, A., Diwan, V., & Smets, B. F. (2018). *Biofilm thickness controls the contribution of stochastic and deterministic processes in microbial community assembly*. Abstract from Biofilms8 conference, Aarhus, Denmark.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Biofilm thickness controls the contribution of stochastic and deterministic processes in microbial community assembly

S. Jane Fowler, Elena Torresi, Arnaud Dechesne, Vaibhav Diwan, Barth F. Smets

Niche and neutral theories provide diverging viewpoints on the importance of selection and neutral processes in community assembly. In practice, both deterministic and stochastic factors play a role in microbial community assembly, though little is known about whether the relative importance of these processes can be managed. In this study, we examined the relative contribution of stochastic and deterministic processes in the assembly of biofilms of different thicknesses. This was achieved using Z-carriers[®], biofilm carriers with a grid with controlled wall height that determines maximum biofilm thickness. Duplicate Z-carriers of each thickness (50, 200, 300, 400, 500 μm) were sampled 107 days apart from nitrifying reactors during steady state operation. Influent and effluent were also sampled at intervals. DNA was extracted and subject to 16S rRNA gene amplicon sequencing and qPCR for total Bacteria. Beta-diversity analysis shows that communities on biofilm carriers were distinct from those in the influent and effluent and exhibited less temporal variation in composition than both influent and effluent communities. Variation in microbial community composition over time was greatest in thin biofilms and decreased with thickness. Overall, the biofilm communities were strongly influenced by deterministic processes as only a small number of sequence variants (SVs) were shared between the carriers and influent. The number of shared SVs between the influent and carriers increased with biofilm thickness. Neutral community modelling showed that a greater percentage of these shared SVs were neutrally assembled with increasing thickness, corresponding to a linear relationship between biofilm thickness and migration rate. Together, these observations suggest that biofilm thickness influences the relative importance of neutral and deterministic processes on community assembly. Although selection was important in all biofilm communities, stochastic factors play a greater role in the assembly of thicker biofilms. In addition, the biofilm community composition was stable once established, with increasing stability with biofilm thickness. We propose that in the thin biofilms, the small, active volume is subject to greater competition for space and resources, while in the thicker biofilms, the greater volume and presence of less active lower layers increase the contribution of neutral processes in community assembly.